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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: MIYAKI et al.
Serial No.: 09/381,400
Filed: February 3, 2000
For: SEMICONDUCTOR DEVICE AND ITS MANUFACTURING METHOD
Art Unit: 2826
Examiner: Alexander O. Williams

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REQUEST FOR RECONSIDERATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

May 14, 2003

Sir:

Claims 22-36 are pending in this application. Applicants request reconsideration of the January 14 Office Action.

Applicants gratefully acknowledge the courtesies extended by Examiner Williams during the personal interview on March 25 with applicants' representative, Mr. Oren. The substance of the interview is provided in the following remarks. Applicants would like to correct statements made in the Second Interview Summary Record dated April 3 (prepared and mailed after the personal interview without applicants review). The Interview Summary Record of April 3 indicates that applicants made an argument regarding "no motivation" to use. See last five lines of page 2 of the Interview Summary Record. However, applicants representative made other arguments regarding why the references should be combined. The Interview

Summary Record merely lists one of these reasons. Others arguments discussed at the interview are set forth below.

The Office Action rejects claims 22-26 under 35 U.S.C. § 103(a) over U.S. Patent 5,637,913 to Kajihara et al. (hereafter Kajihara) in view of Japan 63-271939 to Yamamoto (hereafter Yamamoto). The rejection is respectfully traversed.

As discussed below in detail, the Office Action's rejection is based on misinterpretations of both applied references. These misinterpretations result in an improper combination. As discussed during the personal interview, there is no motivation to combine the references as alleged in the Office Action. Rather, the Office Action relies on impermissible hindsight. In view of the improper combination, the rejection based on Kajihara and Yamamoto should be withdrawn.

As discussed during the personal interview, the present specification relates to a semiconductor device having a smaller size die pad as compared to a chip. In this device, an organic film may be used as an insulating film covering a main surface of the chip. During the personal interview, applicants representative explained that the inventors discovered the use of an organic film to hold the balance between different adhesive strengths of the respective materials. The present specification also explains that chip and the die pad may be sealed with resin such that the organic film and the rear surface of the chip contact the resin body. Since the smaller die pad (as compared with the chip) is provided with an organic film over the surface, cracking of resin at a vicinity of the die pad and cracking of resin on

main surface of the chip may be prevented. As discussed below, the applied references do not relate to these features or advantages.

Independent claim 22 recites a semiconductor chip having a main surface and a rear surface. The semiconductor chip has a plurality of semiconductor elements and bonding pads formed on the main surface, and an organic film formed to cover the main surface. The organic film has openings exposing the bonding pads. Claim 22 further recites that a size of the die pad is smaller than a size of the semiconductor chip in a plane view. Additionally, claim 22 recites that parts of the resin body contact with the organic film of the semiconductor chip and a portion of the rear surface of the semiconductor chip except for an area to which the die pad is fixed.

As discussed below, Kajihara and Yamamoto do not teach or suggest the claimed features, namely the organic film formed to cover the main surface (of the semiconductor chip) in combination with the other features of independent claim 22.

Kajihara does not teach or suggest the claimed organic film covering the main surface of the chip. This was previously argued in the November 19, 2002 Request for Reconsideration and discussed at the personal interview. The current Office Action does not allege that Kajihara discloses this feature. Rather, the current Office Action asserts that Kajihara discloses an insulative film (topmost layer of 2). However, the Office Action then states (at page 3, lines 15-17) that:

it is understood to one of ordinary skill in the art to understand the cross hatching representing a insulative film on top of the chip and having an improved reflow cracking resistance (see column 10, lines 29-38).

This statement is a misunderstanding of Kajihara. There is no suggestion in Kajihara for the cross-hatching representing an insulative film on top of the chip and having an improved reflow cracking resistance, even if Kajihara's entire disclosure (including column 10, lines 29-38) is considered. The reason why the reflow cracking resistance can be improved in Kajihara is that the adhered area between a silicon surface on the rear surface of the chip exposed from the die pad and the sealing resin is enlarged by making the external size of the die pad being a chip mounting portion smaller than that of the chip, and consequently, the adhesion between the chip and the sealing resin can be improved and the moisture invasion to the chip rear surface causing the reflow cracking can be prevented. Therefore, there is no disclosure or suggestion for "the insulating film on the chip improves the reflow cracking resistance" as alleged in the Office Action. Kajihara's col. 10, lines 29-38 does not suggest this alleged feature. Should the Patent Office maintain that one skilled in the art would understand that insulative film improves reflow cracking resistance, then the Patent Office is requested to provide a prior art reference showing this feature, and provide proper motivation to make this combination.

In summary, Kajihara does not teach or suggest that an insulating film on the chip has an improved reflow cracking resistance as alleged in the Office Action. The Office Action is improper at least for this reason.

The Office Action then attempts to combine Yamamoto with Kajihara to find the claimed features. In particular, the Office Action asserts that Yamamoto discloses a chip 5 and an organic film 4. The Office Action asserts that Yamamoto discloses that the layer of organic material is made of photosensitive polyimide resins 4 for the purpose of providing a photolithography process that can be finished at one time at the time of opening of the electrode part and having an improved reflow cracking resistance. See page 4, lines 1-4 of the Office Action. However, there is no disclosure or suggestion in Yamamoto that a part of the sealing resin contacts with a part of the rear surface of the chip (i.e., the structure with a die pad smaller than a chip) and the organic film 4 has an improved reflow cracking resistance. Yamamoto does not suggest the features alleged in the Office Action. Further, Yamamoto's English-language Abstract does not even contain the words "reflow cracking resistance." The Office Action is improper at least for this reason.

In spite of these misinterpretations of both Kajihara and Yamamoto, the Office Action then concludes (at page 4, lines 5-8) that features of the claims would have been obvious based on a common purpose relating to reflow cracking resistance. That is, the Office Action justifies the combination by alleging that an improvement of the reflow cracking resistance is a common purpose between the two applied references (and by replacing Yamamoto's photosensitive polyimide organic film with Kajihara's insulative film). This combination is made based on the misunderstandings of the references as discussed above. This combination is also made based of features not disclosed (such as Yamamoto's lack of disclosure of

reflow cracking resistance). As noted above, this combination is improper. Additionally, the combination of the two references based on reflow cracking resistance is clearly based on applicants disclosure as neither reference relates to an organic film and reflow cracking resistance. This is impermissible hindsight, which is also improper. Thus the rejection based on the combination of Kajihara and Yamamoto should be withdrawn at least for these reasons.

As stated above, independent claim 22 recites an organic film to cover the main surface of the semiconductor chip and that a size of the die pad is smaller than a size of the semiconductor chip in plane view. Claim 22 further recites that parts of the resin body contact with the organic of the semiconductor chip and a portion of the rear surface. The present specification make it clear that one reason for these claimed features relates to adhesion strength and reflow cracking resistance. Yamamoto, while disclosing an organic film, does not disclose that a size of the die pad is smaller than a size of the semiconductor chip in plane view. Yamamoto also does not disclose that parts of the resin body contact with the organic film of the semiconductor chip and a portion of the rear surface. Stated differently, Yamamoto discloses that resin does not contact with a rear surface of a chip. There is no motivation to combine Yamamoto's organic film (on a larger die pad) with Kajihara's die having an insulative film on a smaller die pad. The inventors of the present application have invented a unique device having an organic film covering a main surface of a chip in combination with a size of the die pad being smaller than a size of the chip in plane view and that parts of the resin body contact with the organic film

and a portion of the rear surface. The alleged combination, even if made, still does not suggest these features. Additionally, the Office Action can not simply replace Kajihara's insulative film with Yamamoto's organic film without taking into consideration Yamamoto's larger die pad and lack of resin on the rear surface of the chip. The combination if made still does not teach or suggest all the features of independent claim 22.

It is well-founded that when a rejection depends on a combination of prior art references, there must be some teachings, suggestion, or motivation to combine the references. See ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984) and In re Geiger, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987). Applicants have shown that the Patent Office has not provided a teaching, suggestion or motivation to combine the references. The rejection should be withdrawn at least for this reason. Applicants further believe that the Office Action relies on impermissible hindsight to combine the features of these two references. That is, there is no suggestion in either one of the two applied references to make the combination. Rather, the only motivation is provided in applicants' own specification. The Office Action can not use applicants' specification as a "road map" to find the claimed features. As stated in In re Gorman, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991), the references themselves must provide some teaching whereby the applicant's combination would have been obvious. As stated above, Kajihara and Yamamoto do not contain any teaching whereby the

claimed features would have been obvious. Thus, the combination and rejection are improper and should be withdrawn.

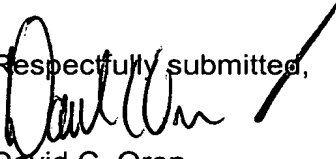
Independent claim 22 therefore defines patentable subject matter.
Independent claim 29 defines patentable subject matter for at least similar reasons.
Claims 23-28 depend from claim 22 and claims 30-36 depend from claim 29 and therefore also define patentable subject matter. Withdrawal of the outstanding rejection under 35 U.S.C. § 103(a) is respectfully requested.

CONCLUSION

In view of the foregoing, it is respectfully submitted that the above identified application is in condition for allowance. Favorable consideration and prompt allowance of claims 22-36 are respectfully requested.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (843.37610X00).

Respectfully submitted,


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